

C-111 Operational Criteria				As Authorized			As modeled for the C&SF Restudy by SFWMMv3.5			
Canal	Reach	Structure	Operation	Base 83	Test 7 Phase I	Test 7 Phase II	95 Base see note 2	50Base see note 3	Alt A see note 4	Alt B,C,D see note 4
L-31N	S-335 to G-211	S-356 S-356 A,B	on	Not Built			Not Built	6.0	6.0	6.0
			off					5.5	5.5	5.5
		G-211	open	Not Built	6.0	6.0	6.0	6.2 ^{see note 3}	6.5 ^{see note 5}	6.0 ^{see note 6}
			close	Built	5.5	5.5	5.5	5.7 ^{see note 3}	6.0 ^{see note 5}	5.5 ^{see note 6}
		S-338	on	5.2 ^{see note 1}	5.8 @ G-211	5.8 @ G-211	5.8 @ G-211	6.0 ^{see note 3}	6.2 ^{see note 5}	5.8 ^{see note 6}
			off	4.8 ^{see note 1}	5.5 @ G-211	5.5 @ G-211	5.5 @ G-211	5.8 ^{see note 3}	5.8 ^{see note 5}	5.5 ^{see note 6}
L-31N	G-211 to S-331	S-331 and S-173	on	5.2 ^{see note 1}	See Angel's well criteria below		Angel's well criteria	5.2	4.8	4.8
			off	4.8 ^{see note 1}				4.8	4.3	4.3
L-31N	S-331 to S-176	S-194	open	5.7	See note for S-194 and S-196 below	5.7	5.3	5.7	5.5	5.5
			close	5.3		5.3	4.8	5.3	4.8	4.8
		S-196	open	5.7		5.7	5.5	5.7	5.5	5.5
			close	5.3		5.3	4.8	5.3	4.8	4.8
		S-176	open	6.0	5.0	5.2	5.0	6.0	5.0	5.0
			close	5.3	4.75 [4.6] ⁷	5.0 [4.8]	4.75	5.3	4.75	4.75
		S-332A	on	Not Built			Not Built	5.5	4.75	4.75
			off					5.1	4.5	4.5
		S-332B	on	Not Built			Not Built	5.5	4.75	4.75
			off					5.1	4.5	4.5
		S-332D	on	Not Built		5.0	Not Built	5.0	4.75	4.75
			off			4.8		4.8	4.5	4.5
L-31W	South of S-174	S-332	on	4.6	See S-332 note below		3.7 (4.7) ⁷	Removed		
			off	4.5			3.3 (4.3)			
		S175	open	4.7	4.7	closed	4.7	Removed		
			close	4.3	4.3	closed	4.3			
C-111	S-176 to S-177	S-177	open	5.2	4.2	4.2	4.2	5.2	4.2	4.2
			close	4.3	3.6	3.6	3.6	4.3	3.6	3.6
	S-177 to S-18C	S-18C	open	2.4	2.6	2.6	2.6	2.4	2.4	Removed
			close	1.6	2.3	2.3	2.3	1.6	1.6	
	S-18C to S-197	S-197	open	See S-197 criteria below			2.5	2.5	2.5	Removed
			close				2.3	2.3	2.3	
	C-500 east of S-332E	S-332E	on	Not Built			Not Built	2.4	2.4	2.4
			off					1.6	1.6	1.6

Notes:

1. Operation of S-338 and S-331 not authorized for flood control pumping in Base 83.
2. 95 Base modeled the same as the authorized operation of Test 7 Phase I.
3. 50 Base modeled the same as the authorized operation of Base 83 except that the reach of L-31N from S-335 to G-211 is modeled to favor pumping out of S-356 **before** structures G-211 and S-338 are fully open.
4. In Alts A, B, C, D, structures were operated at lower stages to improve water deliveries to the ENP and reduce the risk of flooding in southeast Dade county.
5. In Alt A, the western C-4 divide structure holds water to the west of the divide at higher levels than in the 50 Base. Hence S-338 and G-211 are operated at higher stages to prevent (a) excessive seepage, and recycling of seepage, in the vicinity of L-31N, and (b) excess flow to tide through S-338.
6. In Alts B, C, D, L-31 N was relocated east of Krome Avenue to provide a separate route of regional water deliveries to the South Dade Conveyance System. G-211 and S-338 take water from the relocated L-31N, hence operation of these structures is lower (same as 95 Base) to provide the current level of flood protection to the east.
7. Values in () indicate wet season operation if different from dry season. Values in [] indicate operation during flood conditions.

Pump capacities:

S-331 = 1161 (cfs (design), 1380 cfs (max capacity)

S-332A = 300 cfs

S-332B = 400 cfs

S-332D = 500 cfs

S-332E = 50 cfs for 50 Base and Alt A, 500 cfs for Alts B, C, D

S-332: Base 83, 95 Base, 50 Base = 165 cfs

Test 7 Phase I: Pump up to 165 cfs between January and June to maintain target L-31W stage between 3.0 and 4.7 ft.
Pump to 500 cfs between July and December to maintain target L-31W stage between 3.0 and 4.7 ft.

Test 7 Phase II: Minimize pumping. pump up to 165 cfs to maintain target L-31W stage above 3.0 ft, no max.

S-356 = 900 cfs (relocated to S-356A and S-356B in Alternatives A through D)

S-356A = 900 cfs For Alts A, B, C, D

S-356B = 900 cfs For Alts A, B, C, D

Angel's well criteria for operating S-331:

As Authorized	As modeled for the C&SF Restudy by SFWMMv3.5
<p>If Angel's well trigger < 5.5 then flexibility in operating L-31N</p> <p>If $5.5 \leq \text{Angel's} \leq 6.0$, then pump to maintain daily average S-331 HW between 4.5 & 5.0 ft.</p> <p>If Angels > 6.0, then pump to maintain daily average S-331 HW between 4.0 and 4.5 ft until Angel's < 5.7</p> <p>Terminate pumping if S-176 HW > 5.5 ft</p> <p>Terminate pumping if $5.5 < \text{S-176 HW} < 5.0$ ft and heavy rain is forecast</p> <p>Terminate pumping if S-331 tailwater > 6.0 ft</p> <p>Resume pumping when S-176 HW falls below 5.0 ft</p>	<p>If Angel's well trigger < 5.5, permit only water supply deliveries through S-331</p> <p>If $5.5 \leq \text{Angel's} \leq 6.0$, then pump to draw S-331 HW down to 5.0 ft</p> <p>If Angels > 6.0, then pump to draw S-331 HW down to 4.5 ft until Angel's < 5.7</p> <p>Terminate pumping if S-176 HW > 5.5 ft</p> <p>Do not allow canal levels to fall below 4.3 ft.</p>

S-194 and S-196 criteria:

The Test 7 documentation does not include operation of these structures. Current operational criteria for these structures as detailed in the "Red Books" maintained by the South Florida Water Management District's Operations Division is as follows:

Water supply form WCA-3A to C-102 and C-103, when needed and available.

Alleviate flooding to the west by discharging to C-102 and C-103 when capacity is available.

S-197 criteria:

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<p>83 Base: If S-177 and S-18C open full and S-177 > 4.3 ft, open 3 gates, pull earth plug.</p>	
<p>Test 7 Phases I and II:</p> <p>Open 3 gates if S-177 full open & S-177 > 4.1 ft or S-18C > 2.8</p> <p>Open 7 gates if S-177 > 4.2 ft for 24 hours or S-18C > 3.1 ft</p> <p>Open 13 gates if S-177 > 4.3 ft or S-18C > 3.3 ft</p> <p>Close when all the conditions below are met</p> <ol style="list-style-type: none"> 1. S-176 < 5.2 ft and S-177 < 4.2 ft 2. Storm moved away from basin 3. After 1 and 2 met, keep the number of S-197 culverts open necessary only to match residual flow through S-176. <p>All culverts closed if S-177 < 4.1 ft after above conditions satisfied.</p>	<p>Open 3 gates if S-177 full open & S-177 > 4.1 ft or S-18C > 2.8</p> <p>Open 7 gates if S-177 > 4.2 ft for 24 hours or S-18C > 3.1 ft</p> <p>Open 13 gates if S-177 > 4.3 ft or S-18C > 3.3 ft</p> <p>As flow through the gates drops below the maximum capacity, close gates successively to permit the same outflow as is passed through S-176. When S-176 flows drop below 500 cfs close S-197 gates completely.</p> <p>Don't allow C-111 canal to be drawn down below 2.3 ft.</p>

For more detailed description of Test 7 operational criteria, please refer to Appendix C, Test 7 Environmental Assessment.

Modeling of operation of gated spillways and culverts:

Assumption made in the South Florida Water Management Model for the operation of gated spillways and culverts are:

Stage rising: Structure starts opening when HW reaches stage corresponding to "close", and is fully open when HW reaches stage corresponding to "open".

Stage falling: Structure starts closing when HW reaches stage corresponding to "open", and is fully closed when HW reaches stage corresponding to "close".

Structure discharge is defined by,

$$Q = c.f.(\Delta h)^a$$

where c is a structure discharge coefficient, $\Delta h = HW - TW$, a is an exponent (normally equal to 0.5), and the fraction of structure flow capacity f is defined by,

$$f = \left(\frac{HW - h_{close}}{h_{open} - h_{close}} \right)^2$$